

Montana Department of Transportation  
Research Programs  
June 2008

**EVALUATION OF HIGH-PERFORMANCE CONCRETE (HPC) BRIDGE DECK  
CONSTRUCTION REPORT**

**Location:** Interstate 15, Jefferson, Lewis & Clark Counties; Milepost 191.

**Project Name:** South Helena Interchange

**Project Number:** NH-STPU-CM-MT-STPE 15-4(108)191

**Type of Project:** Experimental trial of high-performance concrete (HPC) for placement in interstate bridge deck

**Project Date:** May-September 2007

**Principal Investigator:** Craig Abernathy, Experimental Project Manager

**Objective**

The primary objective of this project is to demonstrate and document the constructability and advantages of high-performance concrete (HPC) in bridge deck construction. Premature deterioration of concrete bridges and new advances in concrete technology make high-performance concrete (HPC) an attractive option for new bridges. Recent MDT sponsored research has developed usable specifications for this area bridge. This research has nominated the use of the HPC specification in South Helena Interchange deck construction.

**Experimental Design**

Perform a pre-pour test at the Lincoln maintenance workshop for the purpose of familiarizing the contractor with the working characteristics of HPC during placement using the same equipment to be used for the actual pour. The same crew will be used for the test pour and bridge deck slab placement. Research will monitor the construction of the deck and report on any construction issues and ongoing performance based on visual documentation.

## **Evaluation Procedures**

During the placement of the test pour and deck pour the researcher (as possible) will be on-site during critical stages. The construction process will be documented and a draft guide for use of HPC in bridges prepared with input from Bridge and Construction staff. An under-deck crack map will be created on an annual basis.

## **Evaluation Schedule**

The data collection and analysis reporting of this effort will be a combined effort of the MDT Bridge/Construction and Research staff. An initial construction report will be published. Research will monitor performance for a period of five years annually, with every year up to \*ten years (informally). This is in accordance with the Department's 'Experimental Project Procedures'. Delivery of a construction/installation report, annual or semi-annual reports is required as well as a final project report, (responsibility of Research).

## **Report Format**

The following information will depict the general events during the test pour and the actual placement of the deck in an effort to document the process for future evaluations. Information about the process that deserves additional response will be covered in the supplemental sections of this report. This report will also include the initial underside deck crack map. A top deck crack map will be in future reports. Research would like to thank Jack Carlson, EPM, Kent Barnes, MDT Bridge Bureau Chief, Mike Lynch, Material Bureau Concrete/Aggregate Supervisor, Bob Seliskar, FHWA, Tamietti Construction and Helena Sand and Gravel for their input and assistance in this effort.

## Construction – Test Slab

The following images depict the events during the test pour at the Lincoln maintenance site (Lincoln Rd. and North Montana Ave.). The date of pour was May 17, 2007.



Pad ready for the HPC pour. ↑



Overview of site with pumping truck in-place. ↑



Beginning of the PCCP placement. The slab was approximately 40' x 80' and 0.5 feet deep. The Bid-well deck paver used will be the same piece of equipment to be used on the South Helena Interchange placement. ⬆



Finishing the pour. ⬆



Applying the wet, burlap mats. ⬆



Installation of the plastic sheeting (Visqueen). ⬆



Finished placement. ⬆

## Supplemental



Towards the end of placement of the HPC, the concrete production plant had a mechanical problem which delayed the delivery of the last few loads. Although the contractor did a good job in keeping the PCCP moist during the delay, there was ripping and tearing of the mud once the Bidwel deck paver was back in operation. The contractor was able to eventually get the surface to a normal appearance.



Close-up of tearing of PCCP during placement.



## South Helena Interchange HPC Deck Pour

The deck placement took place from the end of May until August 10 of 2007. Due to the perceived complexity of the mix design the contractor elected to pour the deck in quadrants starting with the northwest quad, to the northeast quad, southwest quad, and southeast quad respectively.



Staging area on the west-bound lanes of I-15 for the first quadrant pours.



← Start of pour.



← Overview,  
looking north



← Midway through  
placement.



← Front view of placement at midway point.



← Applying the wet burlap.



← End of pour and cleanup.



← Wet burlap application complete, ready to place plastic sheeting for cure.

Additional images from the pours



↑ The contractor switched from a finishing single pan operation to a double pan configuration with better results for surface texture.



↑ Example shot of wetting the burlap prior to the placement of Visqueen (last pour).

## Completed deck



↑ View West



↑ View East

## Under deck images



↑ From east side looking southwest.



↑ From east side looking northwest.



↑ Northeast view.



↑ Southwest view.

Sample images of under-deck cracking



↑ Example of hairline crack in southwest quadrant pours.



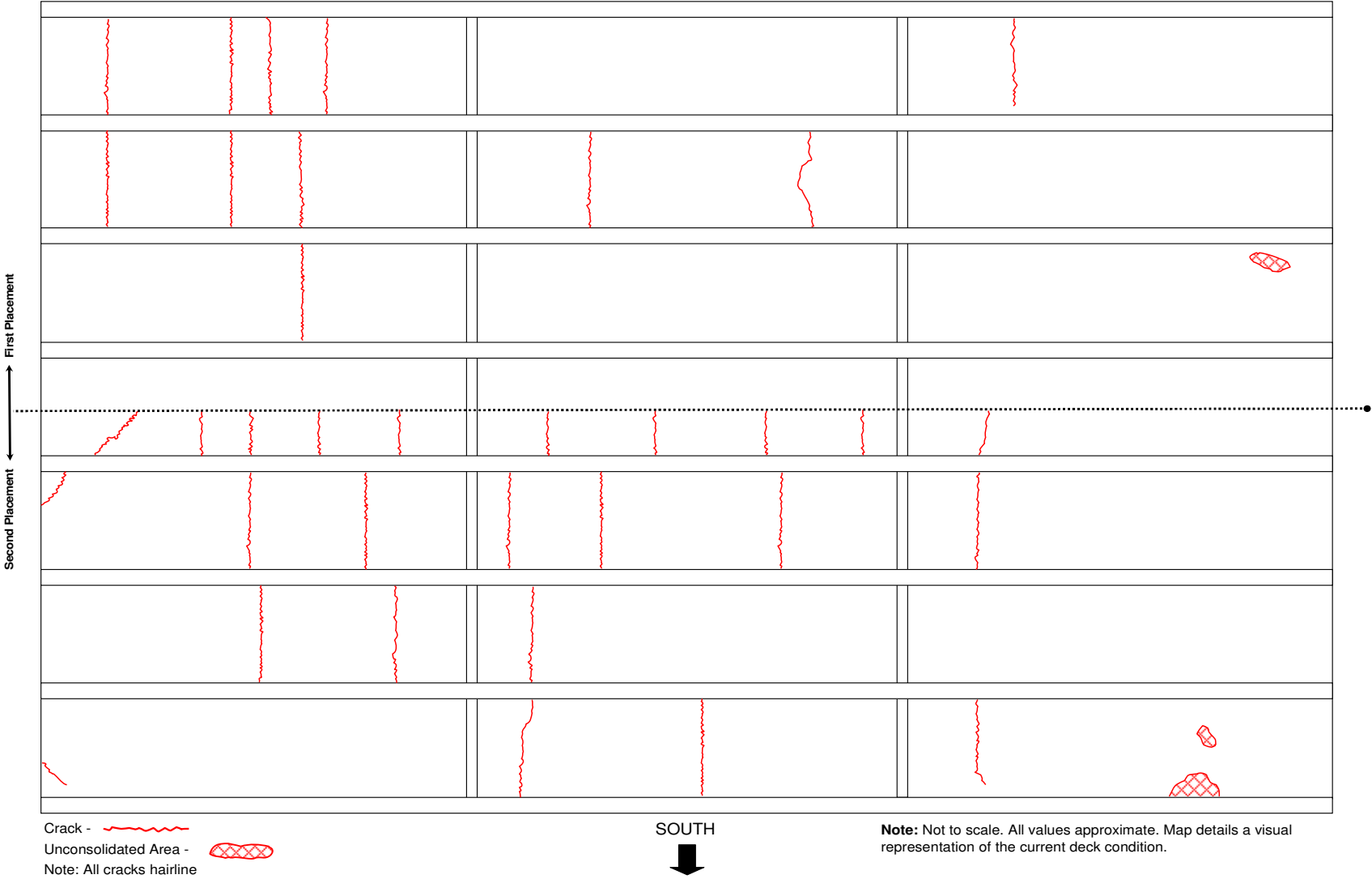
↑ Example of weeping corner crack at southwest area of deck.

### **Supplemental – wet cure**

During the construction phase with the application of the wet burlap, soaker hoses, and visqueen wrap for the wet cure, there were inconsistency with this practice. During numerous visits to inspect the deck during cure it was found a lack of homogenous moisture with the cure. There were areas that looked completely dry, areas that appeared extremely wet and in-between levels of moisture content. It appeared that two hoses were used to apply the moisture per each quadrant cure. Since HPC has very little bleed water during cure this procedure is very important to maintain the quality of the product. It is suggested that the current specification for this procedure be reviewed and that an emphasis with the next installation of an HPC deck the wet cure process be diligently adhered to.

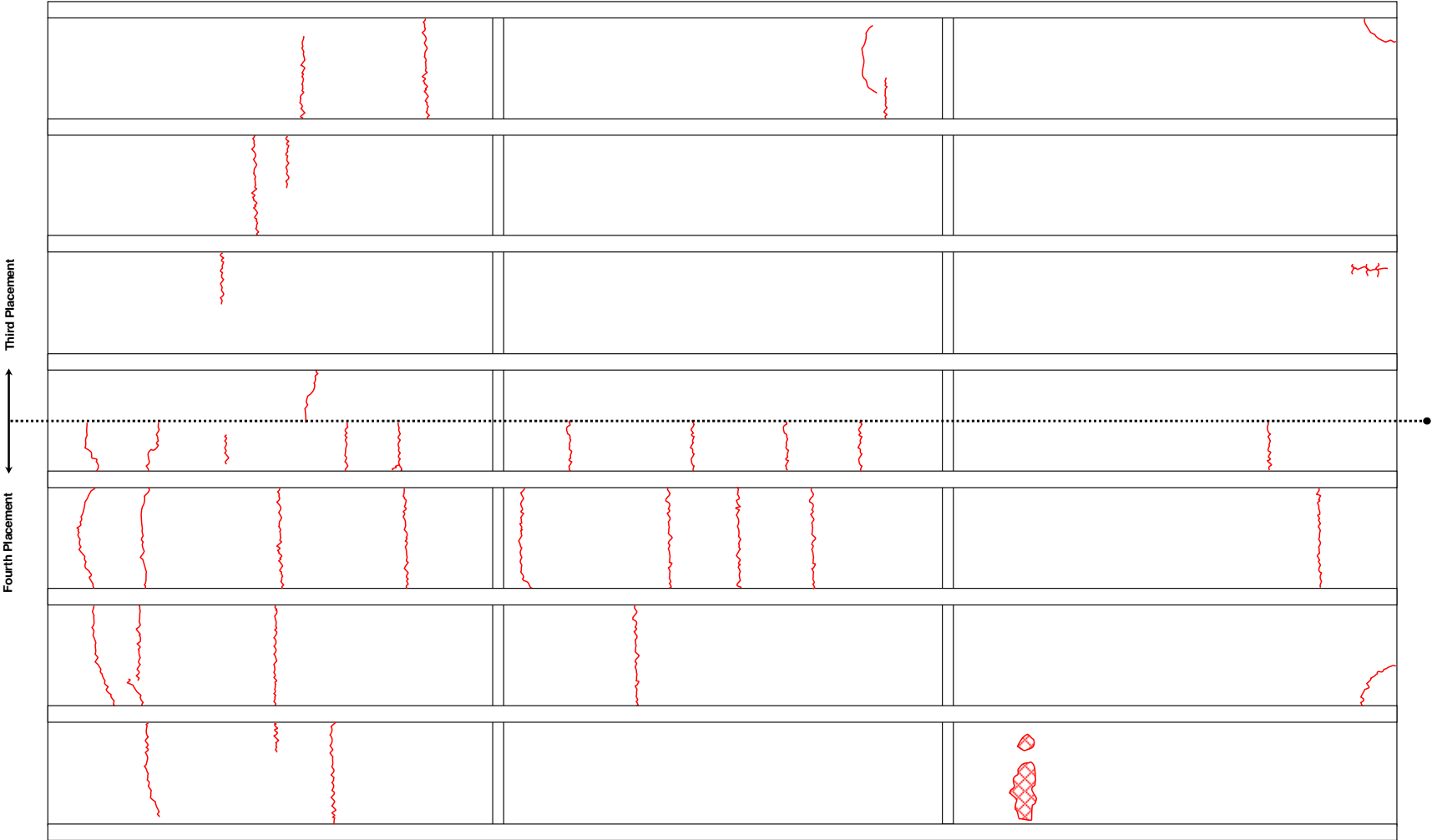
Project Crack Map - August 2007  
NH-STPU-CM-MT-STPE 15-4(108)191  
South Helena Interchange: High-Performance Concrete Deck



UNDERSIDE- WEST HALF: Deck condition as of August 2007



Project Crack Map - August 2007  
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South Helena Interchange: High-Performance Concrete Deck

UNDERSIDE- EAST HALF: Deck condition as of August 2007



Crack -   
Unconsolidated Area -   
Note: All cracks hairline

SOUTH  


**Note:** Not to scale. All values approximate. Map details a visual representation of the current deck condition